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Tissue Culture and Epigenetics

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A boost of 20-30 per cent in yield is expected from tissue culture-derived planting materials. Troubled by a shrinking land resource, cloning good performing palms is a well-received sustainable alternative. Cloning of elite oil palms is entrenched in breeding programmes as a way to outpace the long breeding cycle of the oil palm which generally results in slow introduction of new improved planting materials into the commercial pool. However, the emergence of a somaclonal variant known as the mantled phenotype, which drastically reduced yield, caused the industry to relook at the strategy as confidence in the cloning technology of oil palm took a nosedive. Aside from knowing that epigenetics was involved, most of the earlier research was unsuccessful in linking any markers to mantling. Through the big data approach the team finally pinned down the cause of mantling to a B-function MADS-box gene, DEFICIENS. The defect is an epigenetic mark regulated by a transposable element, KARMA that causes the formation of abnormal oil palm fruit with pseudocarpels. The hypomethylation of this element, found in the intron of DEFICIENS, is common to all mantled clones along with alternative splicing and loss of small RNA. These findings have been translated into an assay to allow culling of mantled ramets at the nursery before committing limited plantation resources to clonal propagation, a boon to precision agriculture. The discovery of KARMA will certainly fuel a much wanted growth in the oil palm clonal industry as confidence in this technology is expected to soar, thus altering the current plantation scene which relies heavily on planting materials through conventional breeding.

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